APPLICATION OF SOME BIOCHEMICAL METHODS IN BANDICOOT TAXONOMY[1]

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(With four text-figures)

Introduction

The paucity of information concerning even the most common forms of Indian rodents is particularly noteworthy. The full importance of Indian rodents in India generally is not realised (Spillett 1968). Rodent taxonomy suffers seriously from lack of biological information.

In spite of the fact that field rats directly affect the human populations the taxonomy of the genus *Bandicota* was not clear. Ellerman (1963) while studying the genus divided it into two species *B. bengalensis* and *B. indica* and cleared most of the confusions at generic level. While revising the classification of subspecies of *B. bengalensis,* Agrawal and Chakraborty (1976) reduced the number of subspecies described by Ellerman (1963) from seven to three. They have concluded that there is no difference between *B. b. bengalensis, B. b. kok* and *B. b. gracilis.* Bombay variety of field rat is *B. b. kok* (*lordi*) (confirmation from Bombay Natural History Society, Bombay). Does it also belong to the same catagory of *B. b. bengalensis* or whether it shows some variations, remained unconfirmed. The present paper deals with this problem and some modern taxonomical methods which have not been used so far, like the biochemical techniques, were employed in the present studies.

[1] Accepted July 1977.

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Materials and Methods

The classification of local stock of *Bandicota bengalensis* was identified and confirmed by the authorities from Bombay Natural History Society, Bombay and it was concluded that the stock belonged to *Bandicota bengalensis kok* (*lordi*) (Ellerman 1963). To avoid errors resulting from the overlapping of characteristics, sexually mature animals were selected for the present studies. The total number of animals studied was 293.

The measurements of the following regions were recorded :-

External measurements: (1) Complete body, i.e. from tip of the snout to tip of the tail, (2) Head + body, (3) Tail, (4) Pinnae, (5) No. of tail rings and (6) Hindfoot.

Cranial measurements: (1) Occipitonasal length, (2) Nasals and (3) Tooth-row.

The standard deviations from means were calculated for each characteristics. All measurements were taken in mm.

BIOCHEMICAL STUDIES:

The following blood proteins of bandicoot rats were studied. The details are given in author's (1976) thesis for Ph.D.

Haptoglobin and Transferrin: The proce-

TABLE 1

SHOWING AVERAGE MEASUREMENTS (IN MM) WITH STANDARD DEVIATIONS OF THE MORPHOLOGICAL CHARACTERS OF *B. b. kok (lordi)* $N = 293$

Complete Body	Head + Body	Tail	Hind Foot	Width eye to eye	Width ear to ear	Tail Rings	Head (only)		Occipito-nasal	Nasal	Tooth row
438.67	251.13	188.01	45.00	94.17	110.02	187.29	56.92	Arithmatic Mean X	45.75	14.7	7.75
± 26.91	±19.71	±15.35	±2.08	±7.02	±8.09	±17.55	±4.13	Standard Deviation	±2.04	±0.92	±1.16

dure adopted for starch-gel-electrophoreses was the same as that described by Smithes (1959). Buffer used was barbiturate buffer with pH 8.6.

Haemoglobin: Paper electrophoresis method described by Pauling *et al.* (1949) was adopted for the present work.

OBSERVATIONS

General: Though known by the name field rat, as its habitat is in general agricultural fields in rural areas, *B. bengalensis* of Bombay region particularly inhabits human dwellings and leads an epizootic life. They are ferocious in nature and when disturbed they make grinding noises with their prominant incisors. The head is triangular, the tail is short, naked with a number of rings on it. The tip of the tail is mostly white.

Fur and its coloration: The animal possesses short hairs. The fur is soft, especially during winter season. The harshness of the fur is felt due to some hard hairs intermixed with some soft hairs. The colour on the dorsal surface varies in all shades from light to dark black brown while undersurface is in gray tones. Some 5-10 red coloured varieties were also caught in urban areas.

External morphological and cranial measurements: Table 1 shows the average measurements of different characteristics with standard deviations from the means. The measurements tally to certain extent with those mentioned by authorities of Bombay Natural History Society for identifying *B. b. kok (lordi)*. The width of the head at ear to ear region is broadest in comparison with that at eye to eye region; besides, the length of the head is not much elongated like that of *B. indica*. This gives a peculiar triangular appearance to *B. bengalensis's* head. The

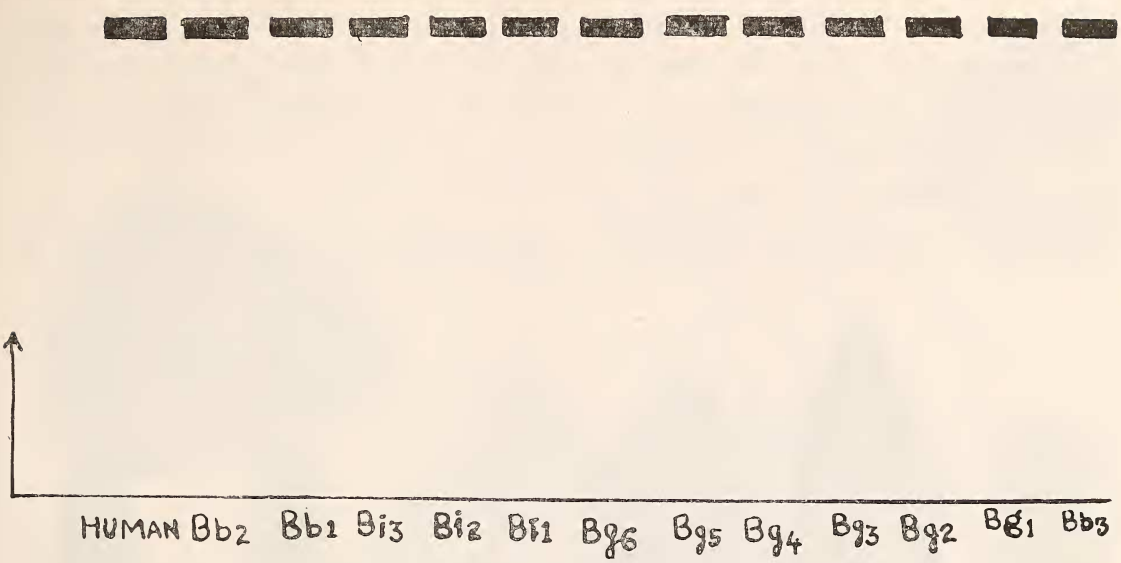

Fig. 1. Diagramatic representation of *Bandicota* haptoglobin patterns by starch gel electrophoresis.
Abbreviations: B.b. = *Bandicota bengalensis;* B.i. = *Bandicota indica;* B.g. = *Bandicota gigantea.*

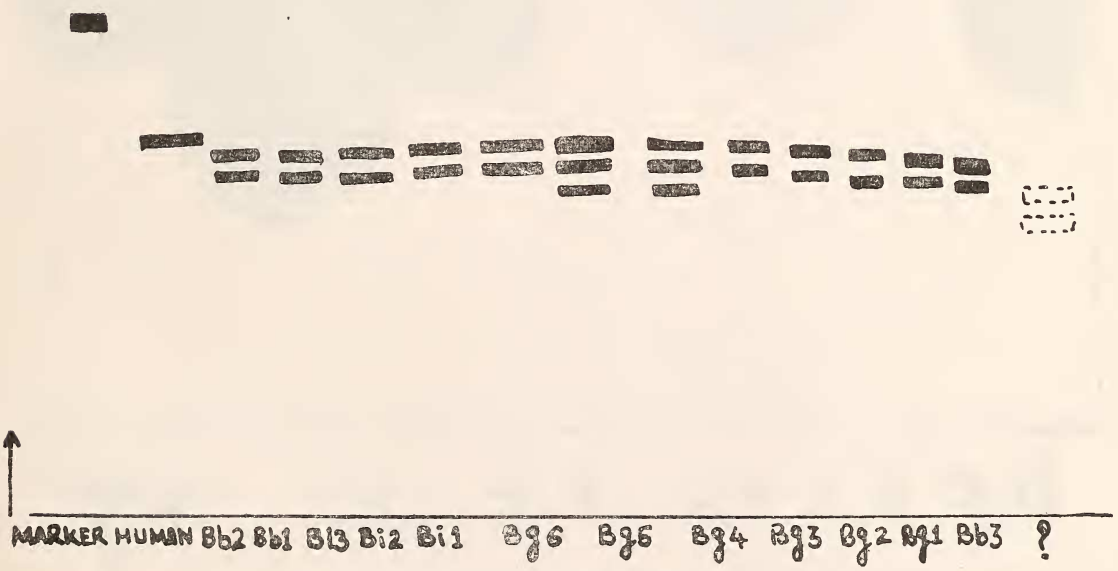

Fig. 2. Diagramatic representation of *Bandicota* transferrin patterns.
Abbreviations: B.b. = *Bandicota bengalensis;* B.i. = *Bandicota indica;* B.g. = *Bandicota gigantea.*

average length of the tail and the number of tail rings are almost same. The rings are stout, complete and well expressed.

Table 1 shows the average measurements of different cranial regions also, *B. bengalensis* possesses a narrow brain case but the width at zygomatic region is comparatively broader. Nasals are short while palatal foramina is long and narrow. The average tooth row was 7.5 mm. The incisors are always yellow in colour as against those of *B. indica* which when alive possesses white incisors.

BIOCHEMICAL STUDIES :

Haptoglobins: Fig. 1 shows the photograph of electropherogram showing that all

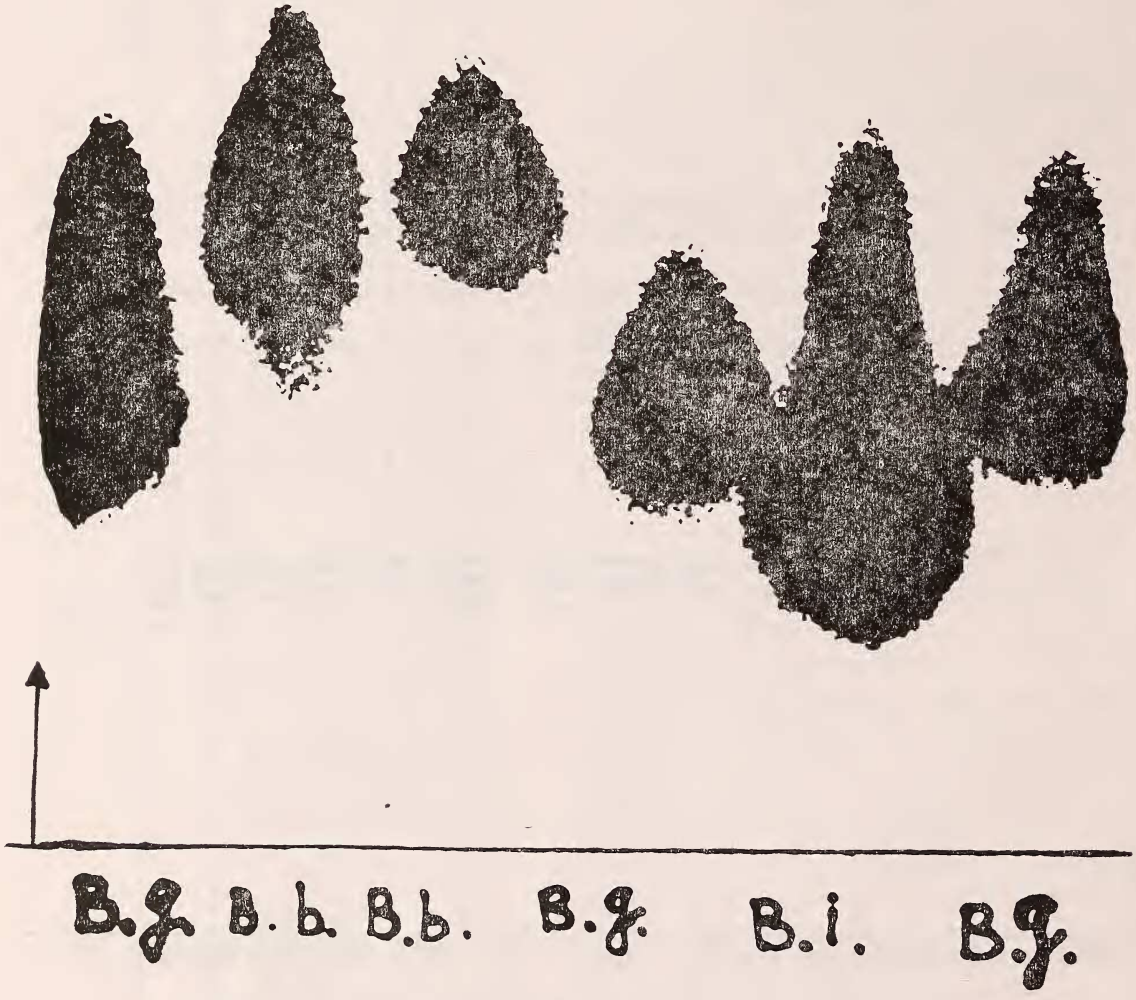

Fig. 3. *Bandicota* haemoglobin patterns by paper electrophoresis.
Abbreviations: B.b. = *Bandicota bengalensis;* B.i. = *Bandicota indica;* B.g. = *Bandicota gigantea.*

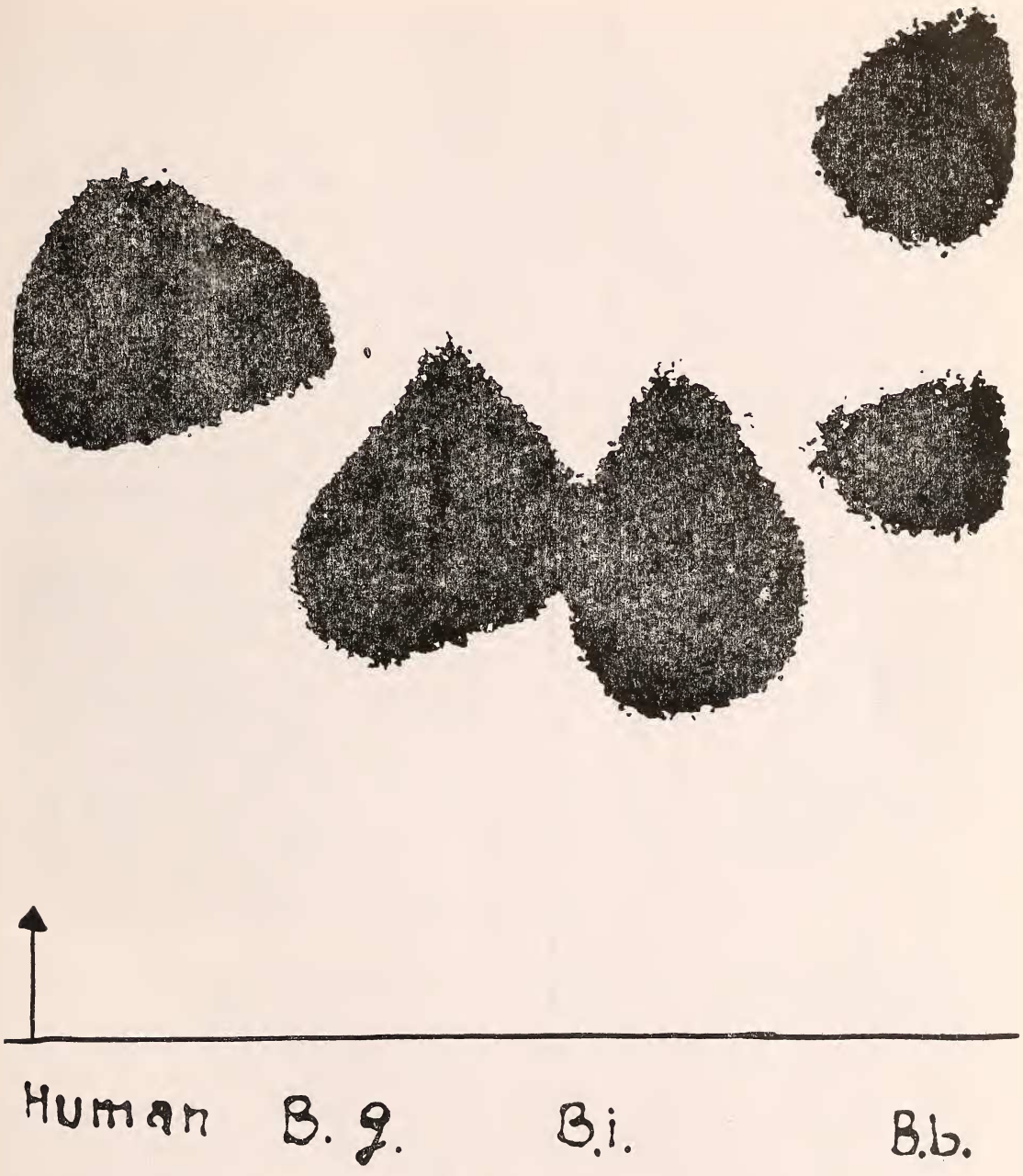

Fig. 4. *Bandicota* haemoglobin patterns showing intrasubspecies haemoglobin polymorphism in *B. bengalensis.*
Abbreviations: B.b. = *Bandicota bengalensis;* B.i. = *Bandicota indica;* B.g. = *Bandicota gigantea.*

TABLE 2

SHOWING COMPARATIVE ACCOUNT OF MEASUREMENTS (IN MM) OF DIFFERENT SUBSP. OF *B. Bengalensis*

Name of the sp.	No. of examples	Reference	Head +Body	Tail	Hind foot	Occipitonasal	Tooth row
B. b. bengalensis	115	Agrawal and	132-237 (139)	99-202 (148)	29-39 (33.0)	33.3-45.5 (39.1)	5.9-8.0 (7.15)
B. b. kok	106	Chakraborty 1976.	128-243 (165)	100-217 (149)	27.44 (33.5)	33.8-45.5 (39.0)	6.3-8.0 (7.25)
B. b. gracilis	14		167-202 (184)	121-170 (140)	28-35 (32)	35.8-42.0 (39 2)	6.2-7.0 (6.7)
B. b. kok (lordi)	293	Pradhan 1976	251.13 ±19.71	188.01 ±15.35	45.00 ±2.08	45.75 ±2.04	7.75 ±1.16

Figures in brackets : Arithmatic Mean X

the species of genus *Bandicota* possess 1/1 (Normal) type of haptoglobin, comparable to that of human type. The mobility of all the haptoglobins was same.

Transferrins: Fig. 2 shows the photograph of bandicoot transferrins. It was observed and confirmed that the field rats, like *R. rattus*, possessed 2/2 types of transferrins in the region of B-2 globulin zone comparable to those reported earlier (TfR and TfN) by Yoshida *et al.* (1971). The mobility of all the types was same. One exceptional type of *B. gigantea* showed the possession of an additional Tf band. This is probably a heterozygous crossbreed of the two different homorygous types of transferrins occurring in the nature (The second probable type is shown in dotted line).

Haemoglobin: Fig. 3 shows the photograph of paper electropherogram showing differences in the mobility of 1/1 type of *Bandicota* haemoglobin. Almost all the samples possessed 1/1 type. *B. bengalensis* haemoglobin has a faster mobility than human type. It probably belongs to HbJ type (Anonymous 1964). One type of *B. bengalensis* was found to possess both the types [HbS HbJ] of haemoglobins (Fig. 4). The occurrence of two haemoglobin bands in that peculiar sample was confirmed by repeating the run.

DISCUSSION

Agrawal and Chakraborty (1976) while comparing the different subsp. of *B. b. bengalensis* confirmed that all the three varieties (*B. b. bengalensis, B. b. kok,* and *B. b. gracilis*) should be kept in a common group of *B. b. bengalensis.* The Bombay variety, which is predominant in this area, is *B. b. kok* (*lordi*). If the morphological measurements

are compared with those mentioned by Agrawal and Chakraborty (1976) it would be observed that *B. b. kok* (*lordi*) is larger in size than the above mentioned three subspecies in most of the respects (Table 2). But the general pattern and coloration do not seem to vary much. Certain key characters like length of hind foot, tooth row etc. show variations to certain extent. The only point of difference lies in the occipitonasal length. All the skulls of mature animals possess the longer occipitonasal length. But the deviation from the standard length mentioned by Ellerman (1963), Agrawal and Chakraborty (1976) does not bring about any change in the general pattern of skull or even in the structure of head.

From the above mentioned points it is apparent that the variety *B. b. kok* (*lordi*) may be the larger form of *B. b. bengalensis* and it will not be wrong to merge this variety with *B. b. bengalensis*. This view may also be supported by biochemical tests of haptoglobin and transferrins [TfR and TfN patterns] which do not show any differences even at generic level. Based on morphological differences like measurements and coloration *B. b. bengalensis* and *B. b. kok* (*lordi*) have been differentiated as two different subsp. But these characters are insufficient to separate these types. It has also been supported by merging some varieties in *B. b. bengalensis* by Agrawal and Chakraborty (1976). But even if this view is accepted, *B. b. kok* (*lordi*) cannot be merged in *B. b. bengalensis*. Because, the genetical differences in haemoglobin patterns still confirm the existence of intra-subspecific polymorphism amongst the subspecies. If other slow moving Hbs type is located, it will be easier to compare the two types even though there exists the morphological differentiation between them.

ACKNOWLEDGEMENTS

I wish to express my deep sense of gratitude to Dr. P. J. Deoras, Prof. Emiritus, Patkar College, for his valuable guidance. The author is thankful to Principal, S.S. & L.S. Patkar College, Goregaon West, Bombay-62, for providing the laboratory facilities; to Dr. S. N. Naik, Animal House In-charge, Tata Cancer Research Institute, Bombay, for his suggestions and also to Dr. B. K. Tikader, Deputy Director, Zoological Survey of India, Poona, for his cooperation.

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